

one hand, and by MM. Macé de Lepinay, Buisson, and René Benoît, on the other. That made use of by M. Guillaume consisted in ascertaining the measurements by mechanical contact—the old method, in fact, of Lefèvre-Gineau, modified by the refinements of modern metrology. In each of the methods the general problem was the same, namely, to determine by lineal measures referred to the prototype metre, the dimensions, and consequently the volume of a solid of definite geometrical form, say a cylinder or cube of brass, or glass, or quartz, of as perfect a form as possible, and then to ascertain the weight, referred to the prototype kilogramme, apparently lost by the solid when immersed in water. The two parts of this operation are of very unequal difficulty; that of ascertaining the dimensions is by far the more difficult. Thanks to the admirable equipment of the bureau, the hydrostatic weighings could be made with a very high degree of accuracy.

It is impossible within the space at disposal to enter into the details of manipulation or to explain the manner in which the experimental methods were carried out. For information on these points the memoirs themselves must be consulted. The final results, obtained after a careful revision of all the calculations, may be thus summarised:—

Method of Contact.

	cm.	kg.	Mass of a cubic decimetre of water	Volume of a kilogramme of water	Weighted Mean
Bronze cylinder of	14	0·9999749	1'0000251		
" "	12	0·9999655	1'0000245		
" "	10	0·9999672	1'0000328		

Interferential Method by Reflexion.

	cm.	kg.	dm ³	
Cube of glass	4	0·9999713	1'0000287	
"	5	{ 1st measure 0·9999789 2nd " 0·9999784	1'0000211 1'0000216	
"	5 reworked	0·9999731	1'0000269	1'000026
"	6	0·9999696	1'0000304	
"	5	0·9999731	1'0000269	

Interferential Method by Transmission.

	cm.	kg.	dm ³	
Cube of quartz	4	0·9999741	1'0000259	
"	5	0·9999729	1'0000271	1'000027

With respect to the relative value of the methods of measurement, there can be little or no doubt in M. Benoît's opinion that those obtained by the method of optical interference are to be preferred to the mechanical method of contact. On the other hand, the older method has the advantage that bodies of larger volume can be employed with a corresponding diminution of error in other directions. The three results are, it will be seen, very close together. The final mean falls between 1'000027 and 1'000028, and is rather nearer the first than the second number.

Accepting the sixth decimal as the limit of accuracy, the ultimate result is that *1 kilogramme of pure water, free from air, at 4°, and under normal pressure, measures 1'000027 cubic decimetre; or that the mass of 1 cubic decimetre of this water is 0·999973 kilogramme.*

The uncertainty of these numbers probably does not exceed 1 in the last figure, or about a milligramme on the kilogramme.

M. René Benoît, the director of the bureau, concludes the *résumé* of the three important memoirs which have led to this result which some general observations on its bearing upon the question of the relation of the actual value of the kilogramme to its original theoretical definition. He justly points out that the original standard kilogramme of Lefèvre-

Gineau and Fabbroni was constructed with a perfection truly admirable, and altogether extraordinary when one considers the general state of science and the means at command in their epoch. Their kilogramme was in effect represented by the mass of a cube of water, the side of which measured not exactly 1 decimetre, but 1'000009 decimetre. Even if it be admitted that such a result could only have been obtained by a fortunate compensation of errors, it is certain that a like perfection can only be secured today by observers equipped with all the resources of modern metrology, working with the most scrupulous care, joined to a critical faculty of the highest order in the sifting and discussion of results.

He points out that whilst it might be possible to construct a new standard kilogramme in closer conformity with its definition, there would be little practical gain in so doing. The litre, the volume of a kilogramme of water, is in practical conformity with the cubic decimetre, not only for the needs of ordinary life but for by far the greater number of the requirements of science. Should any case need a higher degree of precision, there would be no difficulty in the application of a correction based upon the conclusions of the present work of the bureau. M. Benoît sees in the general result a proof of the wisdom of the decision of the International Metric Commission of 1872, not to disturb the original standards, but in constituting the international kilogramme as fundamental prototype simply to copy the old kilogramme of Lefèvre-Gineau and Fabbroni.

T. E. THORPE.

NOTES.

PROF. J. H. POYNTING, F.R.S., has been elected a foreign Fellow of the Reale Accademia dei Lincei.

By the will of Mr. Thomas Lupton, solicitor to the Royal Institution, the institution will receive 10,000*l.* for general purposes.

M. ARMAND GAUTIER will be president of the Paris Academy of Sciences for 1911. M. Lippmann has been elected vice-president.

It has been decided to establish a laboratory for researches in the chemistry of therapeutics in the Pasteur Institute in Paris. The laboratory will be directed by M. Ernest Fourneau.

ON Thursday next, December 29, Prof. Silvanus P. Thompson will commence the Christmas course of six juvenile lectures at the Royal Institution on "Sound, Musical and Non-musical."

THE Paris correspondent of the *Times* reports that Prof. Guignard, who has acted as director of the Paris School of Pharmacy for the last fifteen years, has resigned his appointment, and is succeeded by M. Henry Gautier, professor of mineral chemistry at the school.

THE Institution of Naval Architects, which was founded in 1860, has received an intimation from the Lord President of the Privy Council to the effect that the King has been pleased to approve of the grant to the institution of a Royal Charter of Incorporation.

A CORRESPONDENT of the *Daily Chronicle* states that a brilliant display of aurora borealis was witnessed at Hampstead on Monday, December 19, between 10.30 p.m. and 11 p.m. The display started in the north-north-west, and the streamers spread across the sky so far as the constellation of Orion.

WE learn from *Science* that the Nichols gold medal of the American Chemical Society for the year 1909-10 has been awarded to Prof. M. A. Rosanoff, of Clark University, and his pupil, Mr. C. W. Easley, for their joint study of the partial vapour pressures of binary mixtures. The formal award will take place at the meeting of the New York Section on January 6, 1911.

REFERRING to the letter from Prof. W. A. Douglas Ridge on the tribo luminescence of uranium in NATURE of December 15, Mr. H. A. Kent (The Poplars, Maidstone Road, Bounds Green, N.) writes to say that he noticed similar effects in 1904. He found by filling the tube containing metallic uranium with oxygen the brilliancy was much exalted.

IN continuation of the index volume printed twenty years ago, the Royal Society of Edinburgh has completed an index to the Transactions of the society issued during the years 1889-1908. The volume includes also an address by Sir Wm. Turner, K.C.B., F.R.S., president of the society, delivered at the opening of the new rooms on November 8, 1909.

A PRIZE of 100,000 francs is to be awarded to the inventor of a practical apparatus which will make it possible to save the crews of wrecked submarines, enabling them to regain the surface uninjured. The French Minister of Marine is able to offer the prize, as he has received an anonymous gift from a French lady for the purpose. The conditions under which the prize will be awarded have been officially announced.

A MEMORIAL has been erected, says *Science*, at the National Bacteriological Institute in the City of Mexico to the late Prof. H. T. Ricketts, who at the time of his death was assistant professor of pathology in the University of Chicago and professor-elect of pathology in the University of Pennsylvania. His death was caused by typhus fever, which he contracted while conducting researches in this disease.

AMONG the many curious investigations carried out by means of instantaneous photography, not the least curious are those which Prof. A. M. Worthington, F.R.S., has devoted to the study of the effects produced by the fall of drops or solid spheres into water and other fluid. These investigations will be described and illustrated in this year's Christmas lectures at the Royal Society of Arts by Prof. Worthington.

IN his recent annual report the Secretary of the United States points out that the attainment of the North Pole by Commander Peary has added to the honour and credit of the United States. The Secretary of State therefore recommends that Commander Peary should be given a commission by legislation as rear-admiral of the Corps of Civil Engineers of the U.S. Navy, to date from the day of his discovery, and that he be retired as from that date with the highest retired pay of that grade.

THE death is reported, at the age of sixty-eight, of Dr. Charles Otis Whitman, for the last eighteen years head of the department of zoology and curator of the zoological museum at the University of Chicago. He had previously held appointments at the Imperial University of Japan, the Naples Zoological Station, Harvard University, the Allis Lake Laboratory, and Clark University. From 1888 to 1908 Dr. Whitman was director of the Marine Biological Laboratory at Woods Hole. He was editor of the *Journal of Morphology* and of the *Biological Bulletin*.

ONE of the most promising of American pathologists, Dr. Christian Archibald Herter, has died recently at the early age of forty-five. In 1890 he followed up his studies at Johns Hopkins University and Zurich by publishing a text-book on "The Diagnosis of Nervous Diseases." He then devoted himself especially to pathological chemistry, and held for several years the chair of that subject at the Bellevue Hospital Medical School, New York. Since 1903 he had been professor of pharmacology and therapeutics at the New York College of Physicians and Surgeons. Dr. Herter had carried out several scientific investigations for U.S. Government departments. He was treasurer to the Rockefeller Institute for Medical Research, and had himself created two lectureship foundations, one at Johns Hopkins University and the other at the Bellevue Medical School.

AT the annual meeting of the Yorkshire Naturalists' Union, held at Middlesbrough on Saturday, December 17, a vigorous protest was made against the action of H.M. Stationery Office in reference to the increased prices which have now to be paid for hand-coloured editions of the maps of the geological department. It was pointed out that in withholding from the public cheap and easy access to the results of the Geological Survey, the objects of the Survey were in large measure defeated, and the cost of this department of the public service deprived of much of its justification. At the same meeting Dr. Alfred Harker was elected president for 1911, Mr. H. Culpin the hon. treasurer, and Mr. T. Sheppard hon. secretary.

THE Eastern Telegraph Company report that an earthquake was felt at Zanzibar on December 14 at 11.40 a.m. Greenwich mean time. The shock must have been of great intensity over a wide area, for four of the company's cables between Zanzibar and Durban were broken at about the same time. The first tremors were recorded by the seismograph at Cardiff at about noon, the total duration of the movement there being about two hours.

TWO slight earthquakes were felt throughout Glasgow on Wednesday evening, December 14, the first at 8.54 p.m. and the second shortly after ten. The first shock, which was strong enough to make windows rattle and to throw down some ornaments, lasted four or five seconds, and was accompanied by a loud rumbling noise. The area affected by it extends at least twenty-one miles east and west from Glasgow to Greenock, and ten miles north and south from Milngavie to Johnstone. The seismograph record at Paisley Observatory shows a disturbance, one-tenth of a millimetre in amplitude, at 8.54 p.m., and others of larger amplitude, but not connected with the Glasgow earthquakes, at 9.26 and 9.29 p.m., while a slight movement about 10 p.m. may have been caused by the second shock. The record obtained at the Royal Observatory, Blackford, Edinburgh, at about 10.30 p.m. had, of course, no connection with the Glasgow shocks.

IN a communication published in the *Morning Post* of December 20 Prof. J. Milne, F.R.S., records the following series of earthquakes:—After a long period of rest we have had a succession of large earthquakes. On December 13 there was one on the West Coast of Africa, which broke several cables, and on December 14 one in Scotland. On December 16 one occurred so far off as New Guinea. On December 17, at 7.30 a.m., one reached us from a place so far distant as the West Indies. Next day, at 4 a.m., one came from Java, and in less than two hours, namely, at 5.49 a.m., there was another disturbance in the West Indies. There was a third at 4.50 p.m. With the exception of the disturbance in Scotland they were all very large, and shook quite half the world.

THE subject of the Neolithic age culture in Malta has been dealt with by Dr. Ashby and by Mr. Peek in the last issue of Papers of the British School at Rome. It has often been remarked that up to the present no cemetery of this race has been discovered. In a letter addressed to the *Times* of December 13 Mr. T. Zammit, curator of the Valetta Museum, announces that he has found on the road between Attard and Nobile an undoubted Neolithic interment. No flint implements were discovered with the remains, but the characteristic pottery and the iron ochre pigment in which the bones were soaked leave no doubt regarding the date of the interment. The discovery is most important, because on this evidence Malta falls into line with Sicily and Italy so far as the Neolithic culture is concerned.

At a meeting of the executive committee of the British Science Guild, held on December 14, it was reported that a deputation on behalf of the Guild waited on December 2 upon the private secretary to the Prime Minister to represent the undesirability that Government should part with the site at Fosterdown which had been selected by the Solar Physics Committee three years ago as most desirable for the future site of the Solar Physics Observatory about to be vacated at South Kensington. This site, for some unexplained reason, had been put up by Government to be sold on December 13. The memorial protesting against this sale was signed by the surviving members of the Duke of Devonshire's Commission, past-presidents, and a large numbers of Fellows of the Royal Society, and of the British Science Guild. The Prime Minister was pleased to comply with great alacrity with the prayer of the memorial.

THE Franklin Institute recently awarded the Elliot Cresson gold medal, the highest in the gift of the institute, to several men of science. The secretary of the institute has favoured us with a detailed statement of the grounds of the award in each case "for distinguished leading and directive work," from which we extract the following particulars. The award was made to Dr. Edward Weston, Newark, N.J., for "electrical discovery and in the advancement of electrical application"; to Prof. Ernest Rutherford, F.R.S., for "the advancement of our knowledge of electrical theory"; to Sir Joseph J. Thomson, F.R.S., for "the advancement of our knowledge of the physical sciences"; to Sir Robert A. Hadfield, for "the advancement of our knowledge of metallurgical science"; to Dr. Harvey W. Wiley, chief chemist to the Department of Agriculture, Washington, D.C., for "work in the fields of agricultural and physiological chemistry"; to Mr. John Fritz, Bethlehem, Pa., for "work in the development of the iron and steel industries"; and to Dr. John A. Brashear, of Pittsburg, Pa., for "work in the production and perfection of instruments for astronomical research."

THE late Sir George S. Mackenzie, formerly Administrator of the Imperial British East African Company's Territories, left estate of the gross value of 104,004. 19s. 6d., of which the net personality has been sworn at 99,647l. 17s. 9d. The residue of his property is bequeathed to his children in equal shares, and in the event of his leaving no children the following bequests are made:—(1) To the Ross and Cromarty County Committee 2000l. on trust to found two bursaries each of the value of 30l. per annum, to be known as the "Sir William Mackenzie and the Jessie Mackenzie Inchvannie Bursaries," to be tenable at the Scottish universities for students from Ross and Cromarty, and preferably from the National Schools, for the study of medicine, chemistry, engineering, or agriculture, or other branch of applied science. (2) To the

Royal Geographical Society 1000l. to found a prize to take such form as the council of the society may see fit, and to be in commemoration of the great work done by the British East Africa Company in saving British East Africa for the British Empire. (3) To the president and council of the Royal College of Physicians and the Royal College of Surgeons, England, 30,000l. (subject to life interest of his two brothers), for the endowment of scientific research by students of ability and of registrable medical qualification, who may thus be able to devote their whole energies to such work, and be independent of ordinary practice. This bequest is made in the hope that the combined results of the systematic work of so many trained workers may prepare the way for a genius to come who will make great discoveries.

THE International Exhibition of Hygiene is to be held at Dresden in 1911. The object of this exhibition is in no sense commercial; it is being promoted for purely educational purposes, and it is intended to give hygienists of all nationalities an opportunity of learning what is being done in other countries in the direction of guarding the individual from the many dangers to health which exist, more particularly in our large industrial communities. It will bring home to the public what has been achieved by scientific research in the cause of hygiene, and it cannot fail to offer an impressive object-lesson to a large number of visitors from different countries of the importance, not only from the personal, but from the social and national point of view, of a due regard to the physical welfare of man. There is no doubt that the exhibition will be international in its widest sense, the Governments of far distant countries having already voted considerable sums of money for the proper display of what they have done and what they are doing in the domain of hygiene. To ensure this, the German Government has issued invitations to all the principal nations of the world to take an active part in this philanthropic scheme, and the invitation has been accepted by the very large majority of those to which it was extended. The only great country which stands aloof is Great Britain, a country which is universally regarded as occupying a foremost place among the nations in its appreciation and practical application of the requirements of sanitation. Although our Government, with its characteristic lack of appreciation of scientific work, does not seem disposed to take an official part in this international exhibition, it is to be hoped that money will be obtained from other sources in order to allow Great Britain to be represented adequately.

A CORRESPONDENT, Mr. George Boaq, writing from Aguilas, Murcia, Spain, directs attention to a method devised by Drs. Nasmyth and Graham, of the Provincial Board of Health, Ottawa, for destroying typhoid and dysentery bacilli in water, and rendering it safe for drinking purposes. A level teaspoonful of chloride of lime is rubbed up in a cupful of water, the water being added little by little, so as to obtain a uniform emulsion. This is then diluted with three more cupfuls of water, and one teaspoonful of the dilution is added to two gallons of the water to be purified, mixing thoroughly, and the mixture is allowed to stand for at least ten minutes. The directions are somewhat rough and ready, but if the water tastes distinctly of chlorine sufficient chloride of lime has probably been added. A water containing much organic matter will require more chloride of lime than one containing little organic matter. For a water containing little organic matter one part of chloride of lime per million parts of water suffices, but for an impure water four or five parts may be required. If an excess of

chloride of lime be added the water becomes unpalatable, but the taste disappears on standing, particularly in bright sunshine, or may be destroyed by the addition of a dechlorinating agent such as bisulphite of soda. The efficiency of chlorine and chloride of lime for sterilising water has been amply demonstrated by many observers—Nesfield, Rideal, Thresh, Woodhead, and others.

In view of the recent scare of plague in the Eastern Counties, considerable interest attaches to a paper by Captain W. D. H. Stevenson (Scientific Memoirs by Officers of the Medical and Sanitary Departments, India, No. 38) giving a preliminary account of experiments on the killing of rats and rat-fleas by means of hydrocyanic acid, generated by the action of sulphuric acid on potassium cyanide. Fleas were killed very rapidly by the gas. In one experiment a mixture of 1 ounce of potassium cyanide, 2 ounces of sulphuric acid, and 4 ounces of water was placed in a small room of the capacity of about 346 cubic feet, and the door was then closed. After forty minutes the door was opened, and fifteen minutes later the room was entered; all the fleas left in different parts of the room were killed, even those placed inside four bags, three of blanket and one of cotton, but some of the fleas placed inside a box of clothes survived. Rats were found to require more gas and a longer exposure than fleas. On the other hand, plant-life appears to be uninjured by the gas, and cultures of bacteria were also unaffected by it. Dried grain is not made poisonous for food by the gas, nor are its powers of germination impaired in any way. Moist food-stuffs, however, such as water, milk, butter, and flesh, are said to absorb the poison, and should therefore be removed from a building during fumigation. The gas has no action on metals or fabrics.

THAT dorbeetles and their kindred are generally infested with mites in this country is a well-known fact, but it appears to be a comparatively new discovery that in Ceylon beetles of this group are likewise infested by minute species of flies. In the December number of the *Entomologist's Monthly Magazine* Mr. J. E. Collin describes a new species of small hairy flies of the genus Limosina taken from a coprophagous beetle in Ceylon. The flies were found clinging to the under surface of the beetle, and, instead of attempting to fly away, allowed themselves to be dropped into a collecting tube without change of position.

IN *British Birds* for December it is stated that about 7900 birds were ringed in this country during the year, Messrs. Smalley and Robinson having marked no fewer than 2313 out of this number. In the editor's opinion it is at present too early to decide whether the results will repay the trouble and expense involved in marking. Its chief results will relate to the movements of individual birds, and it is urged that special attention should be paid to the recapture of the smaller marked birds by the editor's correspondents, most of those which have been taken having fallen into the hands of persons unacquainted with the scheme. The costs of the inquiry during last year considerably exceeded the funds at the disposal of its promoter, and if the scheme is to be continued next season it can only be by the aid of special subscriptions.

IN the Proceedings of the United States National Museum (vol. xxxix., 1910, pp. 37-91) Mr. R. E. Snodgrass, whose treatise on the structure of the honey-bee was noticed in NATURE of December 8 (p. 169), publishes an important memoir on the thorax of the Hymenoptera.

In this paper the modification and elaboration of the thoracic skeleton in the various families of the order are described in detail, and illustrated by nineteen text-figures and fifteen plates. The author finds no support for Verhoef's theory that each thoracic segment is a complex of three primitive somites, but prefers to regard the serially arranged sclerites of the mesonotum and metanotum—so fully shown by many Hymenoptera—as evidence of specialisation.

IN vol. v., No. 3, of the *Philippine Journal of Science* Mr. L. E. Griffin publishes additional information with regard to the pearl-fishery, dealing in this instance with the products obtained off Bantayan, an island lying between the northern ends of Negros and Cebu, at the head of the Tañon channel. In May and June, and again in November and December, the water is usually so still and clear that the bottom can be seen to a depth of eight fathoms, and it is at these seasons that the natives look for oysters. In place of forming banks, these occur sporadically, and were it not for the shortness of the season there is little doubt they would long ago have been exterminated. The shells, although of relatively small size, are of excellent quality, but they are chiefly valuable on account of the large percentage of pearls they yield and their fine quality. During the present year one pearl of the value of 80*l.* was collected, while others worth from 20*l.* to 40*l.* each were obtained. The total annual value of the fishery is about 900*l.*

A SURVEY of the vegetation on the Kasatzkisch steppe, near Kursk, is contributed by Mr. V. Alechin to the botanical section (part ii.) of *Travaux de la Société des Naturalistes de St. Pétersbourg* (vol. xli.). The main feature is the great predominance of dicotyledons, although *Carex humilis* takes an important part in the ground cover. The author concludes that the steppes existed previously to the wooded areas, and that they have been but little modified by human agency.

THE suitability of bamboos and lalang, or cogon grass, for making paper pulp is considered by Mr. G. F. Richmond in an article on Philippine fibres published in the *Philippine Journal of Science* (Section A, vol. v., No. 4). Proceeding upon evidence furnished by other investigators and by laboratory experiments, the author takes a favourable view of the prospects of a local soda pulp mill for treating bamboos, and supplies an estimate of the probable cost. Also it is stated that a supply of raw material and the necessary fresh water could be obtained in several localities.

BUD-ROT disease of palms has been notified within recent years from the West Indies, Ceylon, India, and the Philippine Islands, but in most cases the cause of the disease has not been definitely established. Dr. E. J. Butler, who has conducted the investigations in India, where palmyra palms are chiefly attacked, attributes the disease there to a Pythium, deriving his conclusions from the inoculation of healthy palms. The source of the disease in the other countries, where cocoanut palms are infested, is probably different. Dr. Butler has embodied his latest researches, together with a general account of the distribution and remedial measures adopted, in the botanical series (vol. iii., No. 5) of the Memoirs of the Department of Agriculture in India. Two spore forms are recognised; in the ordinary case the contents of a sporangium break up into zoospores, but in hot, dry weather a resting variety of conidium is more commonly found.

THE Journal of the Royal Society of Arts for December 9 contains a paper delivered to the society by Mr. A. Montgomery, State Mining Engineer of Western Australia, on the progress and prospects of mining in Western Australia. Mr. Montgomery states that the metallic minerals occur in very old igneous and sedimentary rocks, which are almost certainly pre-Cambrian. His conclusion is that Western Australia owes the present shape of its surface largely to submergence beneath the sea within post-Tertiary times. The paper was accompanied by an exhaustive statistical appendix, from which we find that for the quinquennium 1903-7 the world's production of gold was 76,000,000, of which the Commonwealth of Australia contributed 20 per cent. and Western Australia 10½ per cent. For the same quinquennium the gold produced has been more than 96 per cent. of the total mineral production, and the mineral export from Western Australia has been 80 per cent. of the total for all the exports from the colony. The value of gold produced per man employed has been more than 400*l.* during the years 1908-9. In regard to the help afforded by the Government to the mining industry, attention is directed to the extensive development of the railway lines and of the systems of water supply; water is sold to the mines at from 4*s.* 9*d.* to 8*s.* 6*d.* per 1000 gallons.

THE November number of *Petermann's Mitteilungen* contains an interesting map of Siberia taken from one published by the Russian Academy of Sciences, which shows the distribution of places where remains of the mammoth and rhinoceros have been found. Most of them lie within the Arctic circle, but one of the former and three of the latter sites lie further to the south.

AN event of much interest in cartography is the completion, after about thirty years' work, of the 1:100,000 map of Germany in 675 sheets. A full account of these maps and the various stages in their development and their production is given by Colonel v. Zglinicki, chief of the cartographic section of the Prussian Survey, in a recent number (No. 9) of the *Zeitschrift der Gesellschaft für Erdkunde*.

THE determination of the international boundaries in Africa proceeds apace, and in Heft 4 of the current volume of *Mitteilungen aus den deutschen Schutzgebieten* are published the latitudes and longitudes which were determined in 1905-7 along the boundary which divides the Cameroons from the French Congo. Neither the time available nor the funds at disposal sufficed to carry out a chain of geodetic triangulation along the boundary, so that it was necessary to rely on astronomical observations alone. Latitudes were determined by circummeridian altitudes of north and south stars, and longitudes by lunar observations, and in three cases only by star occultations. Observations made at the observatories of Greenwich, Paris, and Göttingen were utilised to furnish the final corrections, the uncertainty of the results being ± 2 to ± 5 seconds.

UNDER the title of "The Burial of Olympia," Prof. Ellsworth Huntington in the *Geographical Journal* for December applies the theories advocated in his work "The Pulse of Asia" to the problem of the decadence of Greek civilisation. This is often attributed to deforestation; but from evidence collected in America by Prof. Moore, chief of the United States Weather Bureau, he denies that this can have played an important part in the ruin of the natural resources of Greece. He assumes that pulsatory changes of climate, such as the rapid desiccation of parts of Asia, may have occurred in Greece in the millennium preceding 600 A.D. To these he attributes

many of the world's greatest movements of population, such as the attacks of the barbarians on southern Europe, the invasions of Genghis Khan and Tamerlane, and he connects with these the spread of malaria due to the introduction of the mosquito, for which Greece now became a fitting habitat. In the instructive discussion which followed, these views were criticised by Prof. Myres, Dr. Hogarth, Dr. Stein, Prof. Gregory, and others, most of whom, while admitting the novelty and interest of Prof. Huntington's suggestions, desired further evidence. This may perhaps be gained from Prof. Huntington's recent work in the American deserts; but until the question of North Africa is settled the general problem cannot be finally decided.

IN the *Popular Science Monthly* for December Prof. S. W. Williston discusses the birthplace of man in the light of the palaeontological record. The evidence, he suggests, points to the conclusion that it was in India and its borderlands that the chief domesticated animals were specialised—the genus *Bos* in the Indian Lower Pliocene, the swine, horse, elephant, and the cat tribe; among birds, the ostrich, jungle-fowl, peacock, and grey goose. Man may have been developed in this region during the Late Miocene or Early Pliocene periods. He believes that within a very few years the discovery of indubitable links in man's ancestry will be made in Central Asia, China, or North India, there being no other region to which the palaeontologist looks with more eager expectation for the solution of many profound problems in the phylogenetics and migrations of mammalian life.

THE Transactions of the Leicester Literary and Philosophical Society for 1910 contain two geological papers of interest. Mr. F. Cresswell deals with the frequently discussed question of the origin of the English Triassic strata, with special reference to the Keuper marls. He suggests that the grey bands represent periods of moister climate, when minute organisms reduced the peroxide of iron to protoxide. While regarding the floor on which the English Trias was deposited as a rocky tableland, he falls into a very common error by stating that the Libyan Desert differs from this, being "a uniform sandy plain." Mr. Cresswell fully supports the view that desert conditions prevailed in Triassic times in England, and urges that the Keuper marls are formed of particles worn from igneous and metamorphic rocks by "weathering with a very limited amount of water." Mr. J. McKenzie Newton contributes an essay on the crystallisation of igneous rocks.

IN the Bulletin of the Central Meteorological Observatory of Japan (No. 5, 1910) Mr. T. Okada discusses in great detail the rainy season in Japan, which usually extends from about the middle of June to the middle of July, and is the most important period for the cultivation of rice. To make the investigation more complete, five-day means are given for the whole year for a large number of stations in Japan and adjacent districts, with charts and a short discussion of each of the principal elements. The figures show that in Japan proper the rainfall reaches a maximum at the end of June or in the first decade of July; it then falls to a minimum in August, and again increases to a maximum in September or October. The rainfall of the season in question is chiefly caused by cyclonic disturbances from the Yangtse Valley and Formosa, and is not a simple monsoon rainfall. The period is characterised by continued cloudy weather, large relative humidity, comparatively high temperature, small wind-velocity, and more or less rainfall every day. The discussion extends to eighty-two quarto pages.

THE use of the Clark and Weston cells as standards of electromotive force has necessitated a close study of the properties of cadmium and zinc amalgams, and numerous valuable papers on this subject have issued from the van 't Hoff laboratory at Utrecht. In the current number of the *Zeitschrift für physikalische Chemie* (December 2) is a further contribution from this laboratory by Ernst Cohen and P. J. H. van Ginneken, dealing with the properties of zinc amalgam as affecting the Clark cell. The authors conclude that the formula in current use representing the relation between the E.M.F. and the temperature of the Clark cell is not trustworthy, and should not be employed in accurate measurements. It is further shown that for exact work the Clark cell must be used at temperatures between 20° C. and 38° C.

THE Department of Mines, Canada, has sent us a copy of the report of analyses of ores, fuels, &c., made in the chemical laboratories of the Geological Survey during 1906 and 1907, and of the Mines Branch of the Department of Mines in 1906, 1907, and 1908. With the exception of twenty-seven rock analyses, the work done is chiefly of practical interest, analyses being given of numerous coals, lignites, peats, and ores of iron, copper, and chromium. The results of seventy-seven gold and silver assays show the wide distribution of the precious metals in Canada. In an appendix a description is given of the commercial methods and apparatus used for the analysis of oil-shales.

MESSRS. WHITCOMBE AND TOMBS, LTD., will publish shortly a fully illustrated work on "Australian Plants" suitable for gardens, parks, timber reserves, &c., by Mr. W. B. Guilfoyle.

OUR ASTRONOMICAL COLUMN.

A PROJECTION ON SATURN'S OUTER RING.—During the total eclipse of the moon on November 16 M. Jonckheere directed the 35-cm. equatorial of the Hem Observatory to Saturn, and found a bright projection extending outwards from the eastern extremity of the exterior ring. The projection was best seen with low powers (100 and 200), and its intensity decreased gradually, going from the outer edge of ring A on to the background of the sky. On November 20 and 24 the same projection was seen with difficulty (*Astronomische Nachrichten*, No. 4461).

DISCOVERY OF ANOTHER NOVA, SAGITTARII NO. 3.—In a note appearing in No. 4459 of the *Astronomische Nachrichten* Prof. E. C. Pickering states that Miss Cannon has found that a new star appeared in the constellation Sagittarius on August 10, 1899. A photograph taken on August 9, although showing stars of magnitude 11.5 in the immediate neighbourhood of the nova, shows no trace of it, yet on August 10 it is a conspicuous object of magnitude 8.5. While the outburst was so sudden, the decline, as is common with such objects, was very rapid, for the light faded from 8.6 on August 25 to 10.5 on October 13, 1899; the decrease after that date was more gradual. The nova is not shown on any photograph taken after October, 1901, when its magnitude was about 13.0. The position of this object was R.A.=18h. 12m., dec.=-25° 14' (1875.0); this is about 10m. west of λ Sagittarii and 20m. east of Nova Sagittarii No. 2.

FAYE'S COMET.—Having identified Cerulli's comet with Faye's short-period comet, M. G. Fayet has investigated the orbit with the idea of obtaining closer agreement with Dr. Strömgren's elements. Employing three observations, made between November 10 and 22, he calculated the value for the mean motion and obtained two sets of elements, which, however, were not altogether satisfactory. Then on November 30 he secured a further observation, and this enabled him to apply the method of the variation of geocentric distances and to calculate other systems, the fifth of which agrees very nearly with Dr. Strömgren's elements for 1903, except that the mean motion is 486.792" instead

of 480.16"; they also give a close agreement with the observations. From the best system obtained, which may, however, yet be improved, M. Fayet has calculated an ephemeris giving daily positions up to January 30, 1911 (*Astronomische Nachrichten*, No. 4461).

NEW EXPERIMENTAL DEMONSTRATION OF THE EARTH'S ROTATION.—An interesting description of an experiment devised by Father Hagen to demonstrate the rotation of the earth is described by M. B. Latour in No. 1346 of *Cosmos* (November 12). Father Hagen's apparatus consists of a balanced beam of wood, 9 metres long, which has a bifilar suspension, and to which is attached heavy masses movable in the horizontal plane towards and away from the suspension. In the modified experiment these masses each consist of 80 kilograms of lead mounted in small waggons, which can be automatically released by the fusion of a leaden wire. When released the waggons run towards the centre, the moment of inertia of the beam is modified, and it swings relatively to the earth; the motion is shown by a mirror attached to the suspension and reflecting a beam of light on to a scale fixed on the wall of the circular room wherein the apparatus is installed. When the chariots are made to run from the centre to the extremities the swing of the beam is in the opposite direction and about half the amount. With Father Hagen's apparatus, mounted in the massive tower which carries the astrographic equatorial at the Vatican Observatory, the mean of twenty experiments gave a value for the earth's rotation very near the theoretical value at Rome.

INVESTIGATION OF THE ORBIT OF WOLF'S COMET, 1898-1911.—In No. 4460 of the *Astronomische Nachrichten* M. M. Kamensky gives in brief the results of an elaborate investigation he has made of the movements of Wolf's comet during the period 1898-1911. This is the well-known short-period (6.7 years) comet discovered by Wolf at Heidelberg on September 17, 1884, and independently by Copeland with the spectroscope on September 22; it was reobserved in 1891 and 1898, but was not seen in 1904-5. The orbit was completely transformed by Jupiter in 1875, but the slight differences between the observed and calculated places in 1898 indicate that it is now a permanent member of our system.

M. Kamensky first investigated the motion during the period 1898 August 22 to 1904 June 12, taking into account the perturbations of the earth, Mars, Jupiter, Saturn, and these are published in full in No. 15 (1910) of the *Bulletin de l'Academie Impériale des Sciences de St. Pétersbourg*. He then carried the investigation forward to March 28, 1911, and publishes the full tables in No. 16 of the Bulletin; he also gives elements showing the severe perturbation by Jupiter in 1875, and states that extraordinary changes may again take place at a near approach in the latter part of 1922.

According to the final elements, the next perihelion passage should occur on February 24, 1912, and in Bulletin No. 16 M. Kamensky gives an ephemeris for the period 1911 January 3 to October 14; for the latter date the estimated magnitude is 12.2.

THE LIGHT CHANGES OF FORTY-NINE VARIABLE STARS.—In the fourteenth issue of the *Bulletin International*, published by the Cracow Academy of Sciences, Dr. L. Pračka discusses the light changes of forty-nine variable stars. The observations were made at the Bamberg Observatory during 1905-9, and each star is discussed at length. A summary of the results is given in handy tabular form at the end of the paper showing the elements, the magnitudes and colour, and the form of the light-curve for each object.

THE PHYSICAL SOCIETY'S EXHIBITION.

ON Tuesday, December 20, the Physical Society of London held its annual exhibition of physical apparatus, and the occasion was marked by some interesting experimental lectures. Prof. J. A. Fleming, F.R.S., chose for his subject some improvements in transmitters and receivers for wireless telegraphy, and referred first to his well-known oscillation valve, consisting of a glow lamp in which a metal plate of some convenient form is